Amendments to the Specification:

Page 28, ABSTRACT OF THE DISCLOSURE, replace the existing paragraph with the paragraph below:

~~CONSTELLATION MULTIPLEXED TRANSMITTER AND RECEIVER~~
ABSTRACT OF THE DISCLOSURE

A device of dynamic communication of information allows, on the average, non-integer bits per symbol transmission, using a compact code set or a partial response decoding receiver. A stream of selectable predetermined integer bits, e.g., ***k*** or ***k+1*** data bits, is grouped into a selectable integer number of bit vectors which then are mapped onto corresponding signal constellations forming transmission symbols. Two or more symbols can be grouped and further encoded, so that a symbol is spread across the two or more symbols being communicated. Sequence estimation using, for example, maximum likelihood techniques, as informed by noise estimates relative to the received signal. Each branch metric in computing the path metric of a considered sequence at the receiver is weighted by the inverse of the noise power. It is desirable that the constellation selection, sequence estimation and noise estimation be performed continuously and dynamically.

~~JFO/dmm~~

Page 1, first paragraph, replace the existing paragraph with the paragraph below:

CROSS-REFERENCE TO RELATED APPLICATION

The present application is a ~~continuation-in part~~ continuation of U.S. Patent Application, Serial No. 09/430,466, filed October 29, 1999, and entitled "CONSTELLATION-MULTIPLEXED TRANSMITTER AND RECEIVER" (parent case), which claims priority on the basis of the provisional patent application, Serial No. 60/106,481, filed October 30, 1998, and entitled "CONSTELLATION-MULTIPLEXING CODED MODULATION AND OPTIMUM RECEIVER."

Page 4, first paragraph, replace the existing paragraph with the paragraph below:

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

The present invention provides for processing communication data using a number of information of data bits per transmission signal, which may be a non-integer, with realizable integer or power-of-two constellation sizes. A forward error correction (FEC) code with a proper code rate can be added such that the information bit rate could further be adapted to a signal constellation size that is an integer or a power-of-two. Depending on the required resolution of the average information bits being transmitted in each symbol, a set of FEC codes can be employed to accommodate the desired code rates. However, this resolution can translate into an undesirably large set of embedded codes needed to ~~achieved~~ achieve the target transmission metrics which, for rate-adaptive applications, complicates the design and rate adaptation procedures. In the

invention herein, as few as one fixed trellis code may be used to achieve the desired resolution on the transmission information bits per symbol, simplifying the associated device designs and communication protocols. In the cases where FEC coding is not desirable, or not necessary, the desired resolution on the transmission bits per symbol still can be optimally accommodated through the use of a sequence estimator at its receiver to decode a pre-defined partial response formed for the soft-decision symbols at the receiver.

Page 9, second full paragraph, replace the existing paragraph with the paragraph below:

In the second example, it is desired that the data bits per transmitted symbol be increased to about 7.771 data bits per transmitted symbol, for example, in response to improved channel conditions. Bit parser 41 can selectively and adaptively partition the stream of incoming data bits 42 into one, seven-bit data bit vectors ($\boldsymbol{k}$ = 7), and ~~one~~ seven eight-bit data vector ($\boldsymbol{k+1}$ = 8), each of the data bit vectors being grouped as a transmission symbol, and mapped to a signal constellation of competent configuration. In this case, one power-of-two signal constellation (2^3 = 8 signal values) can be used for all transmission symbols. The resulting predetermined data bit rate is about 7.875 data bits per transmitted symbol ($\boldsymbol{k}$ = 7, $\boldsymbol{p}$ = 7, $\boldsymbol{q}$ = 8), easily accommodating the 7.771 data bits per transmitted symbol.

Page 9, third paragraph, replace the existing paragraph with the paragraph below:

In the third example, should the desired data bits per transmitted symbol over the measuring interval again be increased, for example, in response to further improved channel conditions, and a data bit rate of about 8.198 data bits per transmitted symbol is desired, bit parser 41 can selectively and adaptively partition the stream of incoming data bits 42 into six, eight-bit data bit vectors (k = 8), and two nine-bit data vector ($k+1$ = 9), each of the data bit vectors being grouped as a transmission symbol, and mapped to a signal constellation of competent configuration. In this case, two power-of-two signal constellations (2^3 = 8 signal values and 2^4 = 16 signal values) can be used, the first, smaller signal constellation accommodating eight-bit transmission symbols; the second, larger signal constellation accommodating ~~eight bit~~ nine-bit transmission symbols. The resulting predetermined data bit rate is about 8.250 data bits per transmitted symbol (k = 8, p = 2, q = 8), easily accommodating the 8.198 data bits per transmitted symbol.

Page 12, second full paragraph, replace the existing paragraph with the paragraph below:

Constellation selection controller 49 can govern the selection between selectable predetermined integer numbers of data bits, e.g., k and $k+1$ data bits, in bit vector 43 from bit

parser 41, such that the average transmitted bits per symbol 50 is ***k*** and ***p/q*** ~~41~~ (e.g., 3.25). Controller 49 also can direct the trellis code encoder 45, or constellation mapper 47, or both, to choose the desired constellation size based on the number of bits to be transmitted via the transmission symbol at hand. Where it is desired to further process transmission symbols 50 into signals 52 better suited for a particular transmission format, modulator 51 may be used. Responsive to modulator 51, consecutive symbols can be transmitted at different time stamps, or at different frequency locations, or both.

Page 12, second full paragraph, replace the existing paragraph with the paragraph below:

The optional trellis code used in a system according to the invention herein could be a single symbol code or a multi-symbol code. Figure 5(a) shows an encoder [[50]] 550 that implements a single-symbol trellis code in which ***c*** data bits [[51]] 551, out of each ***k*** or ***k+1*** selectable predetermined integer number of data bits [[52]] 552, provided as data bit vectors by parser [[57]] 557, are encoded to ***c'*** data bits [[53]] 553 through, for example, a convolutional encoder [[54]] 554. Constellation mapper [[55]] 555 converts the encoded data bits [[53]] 553 and uncoded data bits [[51]] 551 into a transmission symbol [[56]] 556 in the desired information format. Figure 5(b) shows an example of an encoder 60 implementing an ***m***-symbol trellis code, in which data bit parser 66 provides a selectable predetermined

integer number of data bits, e.g., ***k*** or ***k+1*** input data bits, corresponding to a single transmission symbol, with ***m*** symbols [[67]]being buffered in symbol buffer 62 before being encoded. Among these selectable predetermined integer number of input bits of the ***m*** transmission symbols[[67]], ***c*** data bits 65 are encoded to ***c'*** data bits 68 again, for example, through encoder 69 which may be a convolutional encoder. These **c'** data bits 68 are combined with uncoded data bits 64 and are mapped in constellation mapper 63 into ***m*** consecutive transmission symbols 71 in preparation for transmission. Note that the ***m*** consecutive transmission symbols do not necessarily use the same constellation.

Page 13, first full paragraph, replace the existing paragraph with the paragraph below:

In Figure 6, receiver 75, which is preferred to be a maximum-likelihood sequence estimator receiver, includes a demodulator 76, noise estimator 77, sequence estimator 78, demapper 79, constellation tables 80, parallel-to-serial converter 81, and constellation selection controller 82. Demodulator 76 recovers received soft-decision symbols r_m 83 from received signal 84, which signal 84 contains original transmission symbols 92 from constellation-multiplexing transmitter [[91]] <u>90</u>, corrupted by channel noise 93. Transmission symbols 92 may be transmitted in signal 84 at different time stamps, different frequency locations, or both. In the case where the transmission symbols 84 were not first encoded in the transmitter 90, it is desired that demodulator 76 forms a partial response on the received symbols so that a

defined correlation, which may exist between received soft-decision symbols r_m 83, can be utilized. It is desirable for noise estimator 77 to associate a noise estimate metric 89 with each soft-decision symbol 83; the noise estimate metric being, for example, a noise power estimate metric or a SNR estimate metric.